being obvious over Dumbaugh in view of Venanzetti Patent No. 3,407,670. Reconsideration of this application is respectfully requested in view of the amendments above and the remarks which follow.

The specification has been amended above to correct a typographical error in the patent number in the last line of the first full paragraph on page 2 of the application. The paragraph bridging pages 10 and 11 of the application has also been amended. The last sentence of this paragraph has been amended to clarify that the stabilizers 24 may be formed in other configurations so long as the stabilizer is relatively rigid in a direction transverse to the line of stroke and relatively weak in the direction of stroke, in accordance with the requirement that stabilization of the drive springs 22 will be relatively rigid in a direction transverse to the line of stroke and relatively weak in the direction of stroke as set forth three sentences earlier in that paragraph. Entry of these amendments to the specification is respectfully requested.

Claims 1-18 were rejected as being obvious over Dumbaugh in view of Rosenstrom. The Office Action states that Dumbaugh lacks the disclosure of two separate pairs of free wheeling eccentric weights, but that Rosenstrom teaches a control system and a plurality of motor and weight pairs in a vibratory apparatus. In Rosenstrom the eccentric weights 50 and 52 are mechanically rotationally coupled to one another, the eccentric weights 54 and 56 are mechanically rotationally coupled to one another, the eccentric weights 50a and 52a are mechanically rotationally coupled to one another, and the eccentric weights 54a and 56a are mechanically rotationally coupled to one another for conjoint rotation. While all of the eccentric weights 50, 52, 54, 56, 50a, 52a, 54a, and 56a are not all mechanically rotationally coupled to one another for conjoint rotation, each of these eccentric weights is forced to phase with the other eccentric weights by an electrical control system. Rosenstrom, at column 4, line 42 states:

> In the invention as illustrated in the environment of FIGS. 1 and 2, it is essential that each drive unit module provide the same angle of attack and the same magnitude of resultant forces. Thus, it is preferred that the counterpart shafts

> within frame 20 have eccentric weights of the same mass and angular orientation as those within frame 18. A control system for assuring the maintenance of the proper phase angles among the various rotating shafts is shown generally in FIG. 1 in which sensing or shaft encoder devices 58 are positioned adjacent each shaft 22, 24 and 22a, 24a. It should be recalled that shafts 26 and 26a are driven respectively by shafts 22 and 22a through a pulley and belt arrangement and must always rotate at the same speed and must have the same actual relative positions at all times.

Consequently while certain of the eccentric weights in Rosenstrom are mechanically rotationally coupled to one another to properly phase with one another, all of the eccentric weights in Rosenstrom are forced to phase with one another by an electrical control system.

Independent claim 1 has been amended above to further clarify that the eccentric weights of the present invention are free-wheeling with respect to one another, and that they are self-phasing with respect to one another. Independent claim 1 thereby requires that the rotatable eccentric weights phase with one another without any outside physical influence to force the phasing of the weights, either through a mechanical connection between the weights, or through electrical synchronization of the rotating weights as is done in Rosenstrom. The eccentric weights in Rosenstrom do not self-phase with one another as required in claim 1, they must be forced to phase with one another through an electrical control system. The electrical controls of the present invention simultaneously vary the rotational speeds of the motors, but they do not control the phasing of the eccentric weights with one another as is done in Rosenstrom.

Independent claim 1 has also been amended to require that the stabilizers be relatively rigid in the direction transverse to the line of stroke and relatively weak in the direction of the line of stroke. There is no teaching in Rosenstrom that a stabilizer of any type is required to be used in connection with a plurality of pairs of rotating eccentric weights in order for the rotating eccentric weights to self-phase with one another as is required in claim 1. Neither does Dumbaugh teach this. It is therefore respectfully submitted that independent claim 1 and its dependent claims are allowable over Dumbaugh and Rosenstrom.

Independent claim 12 has been amended in a similar manner to independent claim 1 in requiring that the rotatable eccentric weights be free-wheeling and self-phasing with respect to one another. Independent claim 12 has also been amended to require that the stabilizers be relatively rigid in a direction transverse to the line of stroke and relatively weak in the direction of the line of stroke. Independent method claim 15 has also been amended to require that the rotating eccentric weights self-phase with one another, and to require a plurality of stabilizers that are relatively rigid in the direction transverse to the line of stroke and relatively weak in the direction of the line of stroke. It is therefore respectfully submitted that independent claim 12 and its dependent claims, and independent claim 15 and its dependent claims, are allowable over Dumbaugh and Rosenstrom for the reasons set forth above.

Claims 1-18 were rejected as being obvious over Dumbaugh in view of Venanzetti. The Office Action states that Venanzetti teaches a plurality of motor and weight pairs in a vibratory apparatus. Figure 3 of Venanzetti shows a vibrator 3 and a vibrator 4. The vibrator 3 includes a shaft 7 having an eccentric weight 5 at a first end and an eccentric weight 6 at a second end of the shaft 7. The vibrator 4 includes a shaft 10 having an eccentric weight 8 at a first end and an eccentric weight 9 at a second end of the shaft 10. The eccentric weight 5 is rotationally offset about the center line of the shaft 7 with respect to the eccentric weight 6. The eccentric weight 8 is similarly rotationally offset about the center line of the shaft 10 from the eccentric weight 9. When the shafts 7 and 10 and their respective eccentric weights rotate, the eccentric weights 5 and 8 each create a resultant output force R_1 and the eccentric weights 6 and 9 each create a resultant output force R_2 as shown in Figure 3. The resulting output forces R_1 respectively act upon the first ends of the shafts 7 and 10 and the resulting output forces R_2 respectively act upon the second ends of the shafts 7 and 10. The resultant output forces R_1 and R_2 that act upon a shaft are not parallel to one another, and therefore the combination of the resultant forces R_1 and R_2 on a shaft creates a torsional force that is applied to the shaft as described at column 2, line

14, of the Venanzetti which states that the arm of the torsional force is formed by the distance between the two eccentric weights of the vibrator. Thus the rotating eccentric weights 5 and 6 create a torsional output force on the shaft 7 that is not perpendicular to the rotational axis of the eccentric weights 5 and 6. A similar torsional output force is created by the forces R_1 and R_2 of the eccentric weights 8 and 9 of the vibrator 4, that is not perpendicular to the rotational axis of the eccentric weights 8 and 9.

In the present application, Figure 3 shows a vibratory motor 11 having eccentric weights 20 attached at each end of the rotary shaft of the motor. The eccentric weights 20 at each end of the motor 11 are aligned with one another about the rotational axis of the weights. The resulting output force F generated by the rotation of the eccentric weights 20 of the motor 11 is generally perpendicular to the axis about which the eccentric weights 20 rotate, as is shown in Figures 8A-8D, wherein the force F extends radially outwardly from and perpendicular to the rotational axis of the weights 20. The present application states at page 3, line 11, that a plurality of eccentric weights that are installed on both ends of a rotatable shaft of a motor are cumulatively considered as a single rotatable eccentric weight in this application. This is because, although there are a plurality of eccentric weights on a shaft of a motor as shown in Figure 3, these weights are accumulatively synchronized together and the resulting output force created by each of these rotating eccentric weights is perpendicular to the rotational axis of the eccentric weight. Consequently the multiple smaller eccentric weights as shown in Figure 3 act as a single larger eccentric weight.

In Venanzetti isolation springs 12 are used to support the spiral elevator 14. No drive springs are used. There is no teaching in Venanzetti that stabilizers, which are relatively rigid in the direction transverse to the line of stroke and relatively weak in the direction of the line of stroke, are needed to self-phase rotating eccentric weights as is required in claim 1. The resultant forces F produced by the eccentric weights 20 of the motors in the present application cause the

drive springs 22 to expand and contract generally linearly along the line of stroke, with no twisting or torsional force being applied to the springs as is done with the rotating eccentric weights in Venanzetti which produce a torsional output force. The rotatable eccentric weights 5 and 6 of Venanzetti, which are considered to be a single eccentric weight as defined in the present application, provide a resultant torsional output force on the shaft 7 rather than an output force that is generally perpendicular to the axis of rotation of the eccentric weights. The vibrators in Venanzetti therefore cannot provide a unidirectional linear vibratory movement as shown in Figures 8A-D of the present application, as can the invention of claim 1. The rotating eccentric weights in Venanzetti are only capable of producing torsional motion or "shaking" up and down motion vibration and cannot provide a unidirectional linear vibration, as can the self-phasing rotatable eccentric weights of the present invention.

In Venanzetti as shown in Figure 5, and as described at column 2, lines 52-55, and in claim 4, a combined torsional twist (rotary) motion and an up and down (shaking) motion are combined to achieve a circular conveying motion. A circular conveying motion can be achieved by two large vibratory motors as shown in Figure 5 of the present application, or by two pairs of free-wheeling self-phasing smaller motors of the present invention as shown in Figures 14A-B. The rotating eccentric weights of the present invention provide an output force that is generally perpendicular to their rotational axis as required in claim 1, and can provide either a unidirectional linear vibratory conveying motion as illustrated in Figures 8A-D or a circular vibratory conveying motion as illustrated in Figures 15A-E. The vibrators is Venanzetti do not provide this capability.

It is respectfully submitted that independent claim 1 and its dependent claims are not obvious over Dumbaugh in view of Venanzetti for the above reasons.

Independent claim 12 has been amended in a manner similar to claim 1 requiring that the stabilizers be relatively rigid in the direction transverse to the line of stroke and relatively weak in the direction of the line of stroke, and that the rotatable eccentric weights are adapted to self-

phase and provide an output force generally perpendicular to their axis of rotation. It is therefore respectfully submitted that independent claim 12 and its dependent claims are allowable over Dumbaugh and Venanzetti.

Independent method claim 15 has also been similarly amended as was claim 1 to require a plurality of stabilizers and to require that the eccentric weights of the vibratory motors self-phase and provide an output force generally perpendicular to the axis of rotation. It is therefore respectfully submitted that independent claim 15 and its dependent claims are allowable over Dumbaugh and Venanzetti.

Claims 14, 17 and 18 have been amended above to further clarify these claims.

Allowance of claims 1-18 as amended above is respectfully requested.

Respectfully submitted,

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Version With Markings to Show Changes Made

In the specification:

At page 2 of the application please rewrite the first full paragraph as follows:

To achieve a circular conveying motion, a pair of rotating eccentric weights are mounted diametrically opposite to one another. Then, by rotating the eccentric weights in the same direction, a "twist" type of vibratory action or circular conveying could be achieved. An example is U.S. Patent No. 3,254,879. As shown therein two electric motors are directly coupled to eccentric weights mounted on a jack shaft. The result is a helical stroke that conveys the contained material in a circular direction. Another example of this situation is illustrated in Dumbaugh U.S. Patent No. 3,178,068 [3,173,068] and in Figures 5A and 5B.

Please rewrite the paragraph bridging pages 10 and 11 as follows:

The "phased" or synchronized eccentric weights 20 on the vibratory motors excite or prompt the steel coil drive springs 22 to move back and forth, or compress and extend, in a straight line of stroke. That "line" is guided by the flat bar type stabilizers 24 installed 90° or perpendicular to the axial centerline of the steel coil drive springs 22. The conveying trough 26 positioned on top of the drive spring brackets 28 vibrates back and forth in reaction to the movement of the counterbalance 16 below. This is in keeping with Newton's Law of an "equal and opposite reaction". Stabilization of the drive springs 22 must be relatively rigid in a direction transverse to the line of stroke and relatively weak in the direction of stroke. For example, the flat bar stabilizer 24 may be five inches wide across its transverse width and only one-eighth inch thick in the direction of the stroke. If the drive springs 22 are not rigidly stabilized in a direction transverse to the line of stroke, then the rotating eccentric weights may not synchronize. The stabilizers 24 may be formed in other configurations than as flat bars so long as the stabilizer is relatively rigid in a direction transverse to the line of stroke and relatively weak in the direction

of stroke [parallel to its longitudinal axis and relatively weak transversely to its longitudinal axis]. The vibratory motors are tilted or inclined from horizontal to agree with the stroke line and the installed inclined angle of the drive springs 22.

In the claims:

Please rewrite claims 1, 12, 14, 15, 17 and 18 as follows: included

1. (Twice Amended) A vibratory conveying apparatus adapted to vibrate along a line of stroke for conveying material, said vibratory conveyor apparatus including:

a bed on which the material is conveyed;

a plurality of inclined stabilizers, each said stabilizer having a first end, a second end and a longitudinal axis, said first end of each said stabilizer being attached to said bed, each said stabilizer being relatively rigid in a direction transverse to the line of stroke and relatively weak in the direction of the line of stroke; 112 2nd

a first pair of rotatable eccentric weights coupled to said bed, said first pair of rotatable eccentric weights including a first rotatable eccentric weight and a second rotatable eccentric weight; and

a second pair of rotatable eccentric weights coupled to said bed, said second pair of rotatable eccentric weights including a third rotatable eccentric weight and a fourth rotatable eccentric weight, [each] said rotatable eccentric weights [weight of said first pair of rotatable eccentric weights and of said second pair of rotatable eccentric weights] being free-wheeling and self-phasing with respect to one another, each said rotatable eccentric weight adapted to provide an output force generally perpendicular to its axis of rotation;

whereby rotation of said first pair of rotatable eccentric weights and rotation of said second pair of rotatable eccentric weights, in combination with said stabilizers, self-phase and

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the output forces of said rotatable eccentric weights accumulatively add to cause said bed to vibrate.

12. (Twice Amended) A vibratory conveying apparatus adapted to vibrate along a line of stroke for conveying material, said vibratory conveying apparatus including:

a bed on which the material is conveyed;

a counterbalance;

a plurality of stabilizers [stabilizer members], each said stabilizer [member] having a first end attached to said bed, a second end attached to said counterbalance and a longitudinal axis, said longitudinal axes of said stabilizers [stabilizer members] being generally parallel to one another, each said stabilizer being relatively rigid in a direction transverse to the line of stroke and relatively weak in the direction of the line of stroke;

a first pair of rotatable eccentric weights rotatably attached to said counterbalance, said first pair of rotatable eccentric weights including a first rotatable eccentric weight and a second rotatable eccentric weight; and

a second pair of rotatable eccentric weights rotatably attached to said counterbalance, said second pair of rotatable eccentric weights including a third rotatable eccentric weight and a fourth rotatable eccentric weight, [each] said rotatable eccentric weights [weight of said first pair of rotatable eccentric weights and of said second pair of rotatable eccentric weights] being free-wheeling and self-phasing with respect to one another, each said rotatable eccentric weight adapted to provide an output force generally perpendicular to its axis of rotation;

whereby rotation of said first pair of rotatable weights and rotation of said second pair of rotatable weights, in combination with said stabilizers, self-phase and the output forces of said rotatable eccentric weights accumulatively add to cause said bed to vibrate.

14. (Amended) The vibratory conveying apparatus of claim 12 including a plurality of drive springs, each said drive spring having a first end attached to said bed, a second end attached to said counterbalance, and a central axis, said stabilizers [stabilizer members] allowing movement of said bed generally parallel to said central axes of said drive springs and inhibiting movement of said bed generally transversely to said central axes of said drive springs.

15. (Twice Amended) A method of vibrating a conveying apparatus along a line of stroke to convey material, said method including the steps of:

providing a bed having an inlet end and an outlet end on which material is adapted to be conveyed;

providing a plurality of drive springs, each drive spring having a first end attached to said bed and a second end attached to a support;

providing a plurality of stabilizers attached to said bed, each said stabilizer being relatively rigid in a direction transverse to the line of stroke and relatively weak in the direction of the line of stroke;

providing a plurality of pairs of vibratory motors, each vibratory motor having a rotatable eccentric weight, [each] said eccentric weights [weight] being free-wheeling and self-phasing with respect to one another, each said vibratory motor adapted to operate at an operating speed and to provide an output force generally perpendicular to its axis of rotation;

operating said vibratory motors to rotate said eccentric weights, such that said rotating eccentric weights self-phase and accumulatively add their output forces and thereby vibrate said bed at a vibration frequency; and

operating <u>each</u> said vibratory motor [motors] at a selected operating speed which approaches being equal to, or is less than, the natural frequency of said drive springs which are vibrating said bed.

17. (Twice Amended) The method of claim 15 including the step of <u>uniformly</u> adjusting the vibration frequency of said bed by <u>electrically and simultaneously adjusting the rotational speed of each of</u> [use of an electrical control connected to] said vibratory motors [for simultaneously changing the rotational speed of said vibratory motors].

18. (Twice Amended) The method of claim 15 including the step of adjusting the operating stroke and frequency of said drive springs and <u>stabilizers</u> [stabilizer members] by use of an electrical control connected to <u>each</u> said vibratory <u>motor</u> [motors] for simultaneously changing the rotational speed of said vibratory motors.